denburg has found eosinophiles, often in large numbers.

Serological tests as aids to the diagnosis of tuberculosis have not as yet proven of any practical value for the recognition of active disease. The fact that the majority of adults probably have latent lesions has decidedly limited the value of the procedures, as is the case with the various tuberculin tests. Today the profession is eagerly looking forward to the time when some means will be discovered by which tuberculous activity can be recognized with certainty at a sufficiently early stage.

Jessen [12] of Davos has recently applied Abderhalden's sero-diagnostic procedure for the detection of specific proteolytic ferments in the serum of tuberculous patients, using a bacillary antigen, extracted with ether, chloroform, and benzol. As a result of his investigations with a large clinical material he concluded that a positive reaction means the presence of tuberculous intoxication, and, more significant, that the reaction disappears if clinical healing occurs, or, if in spite of local findings, no intoxication exists. The accuracy of these findings, however, are seriously brought into question by a later communication [13] in which he states that many people with inactive tuberculosis show a decidedly positive reaction.

A more painstaking and intelligent technic in laboratory diagnostic methods should be insisted upon by clinicians generally. A negative report for tubercle bacilli based on an ordinary smear examination should be relegated to mediocrity where it properly belongs. The responsibility for the quality of the laboratory work and the reliability of the report is distinctly up to the clinician. The cellular content of the sputum should be carefully investigated and the various findings carefully studied and correlated with the symptomatology and physical findings if we are to hope for an improvement in our methods of recognizing early tuberculosis.

Bibliography.

1. "A Consideration of Some Non-Tuberculous Lung Infections." George H. Evans. A. J. M. S., 1911, CXLII, 828.
2. For a more detailed description of this procedure the reader is referred to the following articles: Much H. Beit. z. Klinik d. Tuberk., 1907, VIII, 85; Wehrli and Knoll: Beit. z. Klinik d. Tuberk., 1909, XIV, 135; Neumann and Matson: Beit. z. Klinik d. Tuberk., 1912, XXIV, 79; Matson, R. C.: Beit. z. Klinik d. Tuberk., 1912, XXIV, 193.
3. Ann. dell'Instituto Maragliano 7, H. 2.
4. Matson: Beit. z. Klinik d. Tuberk., 1912, XXIV, 193.
5. Roger and Levy-Valensi: Bull. de la Societe Med. Des Hopiteaux, 1909, XXVIII, 321.
6. Brown and Ross: Report Nat. Assoc. S. & P. Tuberculosis, 1912, XXIV, 193.
7. Ridge and Treadgold: Lancet, 1913, II, 382.
8. Wolff-Eisner: "The Ophthalmic and Cutaneous Diagnosis of Tuberc.," 1908.
9. Riviere: "The Early Diagnosis of Tubercle," 1914.
10. Senator: Virchow's Archives, Vol. 131.
11. Wendenburg: Beit. z. Klinik der Tuberk., 1913, XXIX, 103.
12. Jessen: Beit. z. Klinik d. Tuberk., 1913, XXVIII, 489.
13. Jessen: Personal Communication.

THE PROGNOSIS OF PULMONARY TUBERCULOSIS.*

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To prognosticate the duration, course, and termination of any disease is necessarily a hazardous undertaking and pulmonary tuberculosis is no exception to the rule. There are many conditions, however, to guide us in reaching our conclusions. While it is well to look upon all patients in a favorable light, when we come face to face with grim facts day after day it sometimes robs us of our optimism. From the prognostic point of view it might be well to dwell for a moment on the class of individuals this disease selects as its victims. They are usually the unfortunates whose vitality has been lowered by inherited tendencies, by indiscretions on their own part or by the misfortune of not being able to get proper food and hygienic surroundings and the outcome depends to a large extent upon what we may be able to do to remedy the deficiency in each particular case. Unfortunately, in dispensary work, and with a great many cases in private practice the provision of proper means for care is not at present at hand.

When we have taken the history of the patient, made our physical and other examinations and finally reached a diagnosis (if there is a question as to diagnosis the prognosis is much better), now, on what are we to base our predictions?

The family history will possibly give us some light. If, for example, the patient's mother, sister and brother died of pulmonary tuberculosis and the father died young of some other disease, we know that the inherited resistance to any disease and particularly pulmonary tuberculosis is poor; on the other hand, if the father, mother, sisters and brothers are living and well we may assume that his inherited resistance is good. Between these two extremes there is a wide range of possibilities.

Next, the individual himself, his previous history and habits. The prognosis in a patient who has had numerous severe illnesses is probably worse since he is evidently more susceptible than one with a clear previous history. Lues is a notorious predisposing cause and should likewise be taken into consideration in the prognosis. Alcoholism is probably more often present in the previous history than lues and prepares a very fertile soil for the disease and proportionately lowers the resistance to it. We have all seen patients doing well, all symptoms improving, go on a spree and immediately thereafter rapidly decline.

Another characteristic to be given a good deal of weight is the temperament of the individual. To illustrate this I will cite two cases coming under observation, each in an advanced stage, marked involvement of both lungs, very rapid pulse, about the same temperatures and as nearly alike as two cases could be. "A" worked at his trade horseshoeing until the day of examination. He

* Read before the Annual Meeting of the California Association for the Study and Prevention of Tuberculosis, held jointly with the Forty-fourth Annual Meeting of the Medical Society of the State of California, Santa Barbara, April, 1914.

was told he had pulmonary tuberculosis, went home and to bed and died within two weeks. "B" on account of his feeble condition was cautioned not to exert himself on the way home for fear of a collapse and to go immediately to bed upon arrival there. "B" lived exactly four years and supported himself and family about two years and one-half of the time working at his trade as a shirt cutter. It is true the family history was bad in the case of "A" and fairly good in the case of "B" but we were strongly impressed by the marked difference in the mental effect on each patient.

The age of the patient. The death rate is undoubtedly greatest during the middle years of life and the prognosis, all things being equal, is rather more favorable in the very young and in those past middle life. The disease seems to run a slower course after middle life. The diagnosis to me seems somewhat harder to make in children than in adults but I have seen some cases in children with definite diagnoses do remarkably well. One patient, a boy ten years of age with a cavity diagnosed in the right apex by several physicians and confirmed by X-ray, and considered in a very critical condition in April, 1912, had gained sixteen pounds in weight and practically all symptoms except a slight cough with a little expectoration in the morning had disappeared one year later, sputum still positive. In December, 1913, boy looked perfectly well, physical examination showed very slightly impaired resonance at apices, no other signs of disease detected and sputum negative. Had gained four more pounds in weight. This patient had home treatment.

The ages at time of death of 96 patients at the San Francisco Tuberculosis Hospital were as follows:

Under 10 years	1
10 to 19 inclusive	2
20 to 29 "	19
30 to 39 "	29
40 to 49 "	23
50 to 59 "	12
Over 60 years	10

The figure under ten years should not be considered for we have very few children to care for.

In the female, as a rule, the advent of pregnancy renders the outcome less favorable. However, in recent years many women have been successfully carried through this condition.

The rapidity of progress of the disease, or the stage of the disease taken in connection with the date of apparent onset. The outlook is rather better with a history of slow progress than with a history of rapid progress.

We now come to the stage of the disease as a factor in prognosis. Using the classification of the National Association the prognosis follows very closely its stages but by no means always; more favorable in incipient, less so in moderately advanced and, as a rule, bad in far advanced, but there are many exceptions to this rule and for prognostic purposes the classification cannot serve definitely. We have all seen some incipient cases run a very rapid and fatal course and some far advanced cases progress very slowly and even become arrested. One case coming under my observation in early middle life with a history of short duration, the physical examination showing a small lesion at one apex with other organs apparently normal, died from tubercular meningitis within two weeks after first being seen. On the other hand, a number of far advanced cases have lived and been comfortable for from three to six years or longer. These illustrations demonstrate a point to be considered in making rules for the admission of patients into a state sanatorium, i. e., not to be governed in the admission of patients so much by the stage of the disease as by the showing of improvement while under observation in a suitable institution for a stated period.

To illustrate some of the points mentioned above I give below a few statistics gathered from dispensary and city hospital work in San Francisco to show the class of cases handled and to give some idea of the outcome, also some statistics from other sources.

Patients occupying forty beds at the San Francisco Tuberculosis Hospital during the past few years:

Beds full at present with patients in various stages	40
Discharged improved	23
Discharged unimproved	13
Discharged no comment	38
Died	98
	212

No claim is made for positive cures but several of the above noted as "improved" were arrested cases.

Over forty-six per cent. of the total number died.

47	died	within the first month.
34	"	between one and six months.
7	"	" six and twelve months.
9	"	" one and two years.
1	"	" two and five years.
98		

Quite a large proportion of the 47 died within a few days after being admitted. These figures are from one of five services and I presume the percentages are about the same with the others. At present there are about two hundred beds in the hospital.

But the San Francisco Hospital is not alone in this class of statistics, for in Reprint No. 145, Public Health Reports, Oct. 17th, 1913, Tuberculosis Sanatorium, Fort Stanton, N. M., the following ultimate results of treatment are given:

"Out of 1,924 patients whose treatment terminated more than six months ago, 951 are known to be dead, 687 of these having died at this hospital. The location and condition of 853 could not be ascertained."

An analysis of 414 patients in the Stanford Division of the Tuberculosis Clinic of the San Francisco Association for the Study and Prevention of Tuberculosis:

	Incip.	Mod. Adv.	Far Adv.	
Lost Sight of.				
Within 1 year.....	56	76	51	
Bet. 1 and 2 yrs....	1	3	0	
Bet. 2 and 3 yrs....	1	3	1	
Bet. 3 and 4 yrs....	0	2	0	
Bet. 4 and 5 yrs....	1	0	0	
	59	84	52	Total 195
Under Observation.				
1 year	28	18	14	
2 years	1	2	1	
3 years	0	4	1	
4 years	0	0	1	
5 years	0	2	0	
	29	26	17	Total 72
Undiagnosed, non-tub. or tub. of other organs.....				73
Died				74
				Total 414

Deaths occurred as follows:

	Incip.	Mod. Adv.	Far Adv.	
Within 1 year.....	1	15	43	
Bet. 1 and 2 yrs....	0	1	6	
Bet. 2 and 3 yrs....	0	2	1	
Bet. 3 and 4 yrs....	0	0	3	
Bet. 4 and 5 yrs....	0	1	1	
Bet. 5 and 6 yrs....	0	0	1	
	1	18	55	Total 74

In looking over the cases lost sight of and the cases under observation it will be noticed that a majority were lost sight of within one year and most of those under observation have been so less than one year, showing how transient these patients are.

It will be noticed that the deaths have followed very closely the original diagnosis as to stage.

To show that clinical experience is very much the same in other parts of the country I quote from Report No. 7 of the Henry Phipps Institute, dated April 1, 1913:

The patients under consideration visited the Phipps Institute in the second year of its existence, Feb. 1, 1904, to Feb. 1, 1905. The investigation was completed Sept. 1, 1911.

"Of 915 patients but 274 attended the following year and rapidly diminished each year. Applicants non-tubercular or not destitute 152. Patients known to be living at time of investigation, 184. Patients known to be dead, 380, or 41.5%. Patients untraced, 320, or 34.9%.

Outcome of 184 cases:

	Prognosis.	No sympt.	Sympt.	At work.	Not working.
Favorable	121	80	18	82	8
Doubtful	34	19	16	22	5
Unfavorable	5	3	2	3	2
No record	24	In addition there were 24 who were living but gave no information as to their health or occupation.			
	184				

Of 107 now known to be living the sputum was positive in 9, negative in 47, and no examination recorded in 49. There was, however, one or more suggestive symptom.

We have dealt above with the most discouraging type of cases. Let us now consider the class of patients admitted to the New York Sanatoria, the tuberculous poor of New York, for the most part incipient, but a few in other stages who offered some hope of improvement. Nine hundred and seventy-five patients are considered; on admission they were divided as follows: 644 incipient, 252 moderately advanced and 79 advanced; of these 20.1% were discharged cured, 25.4 arrested, 33.6 improved and 20.8 unimproved. Five hundred and fifty of these cases were able to be traced and out of 358 admitted as incipient 12% died within a year of discharge; out of 144 moderately advanced cases 23% died within a year of discharge and out of 48 advanced cases 25% died within a year of discharge. For a further study of these cases you are referred to a most carefully prepared article by Dr. Chas. F. Bolduan in an investigation carried on by The Council of Jewish Women, Monograph Series, No. 8, October, 1913, Department of Health of the City of New York. So it will be seen that the outlook is brightening with the selection of cases and with better means for care.

U. S. Army General Hospital, Fort Bayard, N. M., 1911. Result of treatment in completed cases.

	Ap. C.	Ar.	Imp.	Unimp.	Died.
Incipient 16	18.75%	12.5%	56.25%	6.25%	6.25%
Mod. Adv....196	4.59	7.4	70.40	14.79	3.06
Far Adv.....144	0.00	.69	61.11	18.73	19.44

The Barlow Sanatorium, California, Tenth Annual Report, Sept. 1, 1913. "Requirements for admission. Free from complications. They must be in a condition so that a cure or improvement could be reasonably expected."

Apparently arrested, 19—32.75%. Quiescent, 9—15.51%. Improved, 20—34.48%. Failed, 6—10.34%. Died, 4—6.89%. A total of 58 cases.

The Pottenger Sanatorium, Monrovia, Cal.:

Number of patients discharged, 800.

Number remaining over three months, 468; covering a period of five years.

	I Stage.	II Stage.	III Stage.
Apparently cured or arrested.	92%	76%	36%
Improved	8%	25%	38%
Unimproved or died.....		6%	26%

These sanatoria have been selected as types and because we are all more or less familiar with them. With the class of patients in the public hospitals where no selection is made the prognosis as a whole is not very good but as we go up the scale to the private sanatoria where the early diagnosed cases are cared for the percentage of cured and arrested cases improves.

In this paper I have not attempted to compare the results of home treatment with the treatment in sanatoria. Many patients will do better at home than at sanatoria but in all probability sanatorium treatment is preferable for a majority, for a time at least.

Notwithstanding our natural advantages in California we are not giving the tuberculous poor the opportunities they should have. I believe the cities and counties throughout the state are taking excellent care of the advanced cases, at least I know San Francisco is. The San Francisco Tuberculosis Hospital has made rapid strides forward in the past few years under its present management and in the near future it will probably have a new hospital building. The San Francisco Society for the Study and Prevention of Tuberculosis is likewise doing a good work but necessarily its field is restricted. The greatest good for the greatest numbers, however, can not be obtained until the state as a whole helps. There should be an establishment for the hopeless cases and for those under observation; a place for incipient and for the more advanced cases showing an improvement, and a place for discharged patients to earn a living where they may be under proper supervision. The above in addition to the clinics with social workers. It might be argued that each large community might have a complete set of institu-

tions but it seems to me that for economic reasons it would be better for the state to furnish one or two of these institutions, or, possibly combine two in one. Until these units are a reality patients in the present city institutions will continue to run around the circle: In the hospital until their improvement warrants their discharge to make room for more advanced cases, then after working a while at improper work to the clinic in a worse condition, then back to the hospital as bed patients. Too often have we who are doing dispensary work seen the operation of this circle. It makes no difference whether the patient returns again to the San Francisco Hospital or decides to go to the Los Angeles Hospital, the circle is there just the same and the prognosis in this great majority will continue to be bad.

Lastly, the opportunity for proper treatment and care. A majority of the tuberculous in every day life are not able to get this care and are obliged to work to support themselves and those dependent upon them at vocations not suited to their condition until the disease has progressed to such a stage that hope for cure or the arresting of the disease is out of the question. And this opportunity for proper treatment and care is by far the greatest factor in determining our prognosis, for without it hope is practically gone and in proportion to the degree of care and attention the patient is able to receive in that same proportion does the outlook for future improvement brighten.

THE TREATMENT OF PULMONARY HEMORRHAGE.*

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My excuse for presenting a paper to this society upon this subject is the great variation and lack of logic of the medicinal treatment as given by the various authors.

In considering the treatment of a hemorrhage there are three essential things from the conditions of which must evolve the theories regarding the treatment. The first is the condition of the ruptured vessel; the second, the condition of the elements of the blood which make up the clot, and the third is the pressure under which the blood is flowing in the vessel.

In pulmonary hemorrhage there are two sets of vessels to consider, the bronchial and the pulmonary. Of these two sets there are three portions, any one of which may be ruptured, viz.: artery, vein or capillary.

Rasmussen,[1] in 1868, studied pathological specimens of the lungs in pulmonary hemorrhage, and came to the conclusion that hemorrhage nearly always took place from the pulmonary arteries. Preceding the hemorrhage small aneurisms were formed, which caused a thinning of the vessel wall. Probably the cases in which the sputum is only slightly streaked come from ruptured capillaries.

In considering the ability of the blood to form a firm clot, the question immediately arises whether in tuberculosis, complicated by pulmonary hemorrhage, there is any change in the elements of the blood which produce the clot. While we have not tested the blood of tuberculous patients for thrombokinase, antithrombin, prothrombin, etc., yet we believe that for all practical purposes, if the clotting period is not increased, if the bleeding time is not lengthened, and if the blood platelets are not diminished, we may conclude that the blood condition is no causative factor in producing or prolonging the hemorrhage.

In our endeavor to ascertain the state of the blood we studied the blood platelets, clotting period and bleeding time upon fourteen cases of pulmonary tuberculosis, nine of which were studied during an attack of hemoptysis.

The platelets were counted after the technic of Wright and Kinnicutt[2] with the brilliant-cresyl blue and potassium cyanide stain. The clotting period was done with Duke's[3] modification of Milian's method, in which a drop of blood 5 mm. in diameter was observed at 40° centigrade until firmly clotted, and the bleeding time was done with Duke's method. A stab wound sufficient to cause free bleeding was made in the ear and in one-half minute a piece of filter paper was applied, taking up all the blood. This was repeated every half minute until no blood appeared. The following table gives the results in the fourteen patients:

Hemorrhage Patients.

	Highest	Lowest	Average
Blood Platelets, 9 cases.	1,194,000	344,000	548,000
	Longest Time	Shortest Time	Aver. Time
Clotting Time, 8 cases.	6 min. 30 sec.	4 min.	5 min. 12 sec.
Bleeding Time, 6 cases.	3 min. 30 sec.	1 min.	2 min. 10 sec.

Patients Having Had No Hemorrhages.

	Highest	Lowest	Average
Blood Platelets, 5 cases.	602,000	271,000	448,400
	Longest Time	Shortest Time	Aver. Time
Clotting Time, 4 cases.	8 min.	6 min.	6 min. 45 sec.
Bleeding Time, 3 cases.	4 min.	2 min. 30 sec.	3 min. 10 sec.

From the foregoing it is noted that, taking 250,000 to 350,000 platelets as the normal, according to Wright's and Kinnicutt's investigation, the average number of platelets was increased in tuberculosis, a greater number being present in hemorrhage cases than in non-hemorrhage cases, the average being 548,000 and 448,400 respectively.

Considering the normal clotting time as being five to eight minutes, my cases all come well within this limit, the average in hemorrhage cases being 5 mins. 12 secs., as against 6 mins. 45 secs. in the non-hemorrhage cases.

Duke found the normal bleeding time with the method used to be one to three minutes. It will be seen that my cases all came practically within these limits, the average in the hemorrhage patients being 2 mins. 10 secs. and in the non-hemorrhage 3 mins. 10 secs.

We would conclude, then, from the few cases observed, that in none of them was the blood con-

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